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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/376,063	08/17/1999	SEIJI ANDOH	OKI-226	5971

23995 7590 03/22/2005

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WASHINGTON, DC 20005

EXAMINER
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DATSKOVSKIY, MICHAEL V

ART UNIT	PAPER NUMBER
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2835

DATE MAILED: 03/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

H.A

<b>Office Action Summary</b>	<b>Application No.</b> 09/376,063	<b>Applicant(s)</b> ANDOH, SEIJI	
	<b>Examiner</b> Michael V. Datskovskiy	<b>Art Unit</b> 2835	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE \_\_\_\_\_ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 22 February 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 20,22,24-29 and 31 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 20,22,24-29 and 31 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 August 1999 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>02/22/05</u> . | 6) <input type="checkbox"/> Other: _____  |

### DETAILED ACTION

1. A request for continued examination under 37 CFR 1.114 was filed in this application after appeal to the Board of Patent Appeals and Interferences, but prior to a decision on the appeal. Since this application is eligible for continued examination under 37 CFR 1.114 and the fee set forth in 37 CFR 1.17(e) has been timely paid, the appeal has been withdrawn pursuant to 37 CFR 1.114 and prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on 02/22/2005 has been entered. All claims are drawn to the same invention claimed in the application prior to the entry of the submission under 37 CFR 1.114 and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the application prior to entry under 37 CFR 1.114. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action after the filing of a request for continued examination and the submission under 37 CFR 1.114. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 20, 22, 24-29 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bond et al.

Bond et al teach a semiconductor device 8, figs 1-6, comprising: a substrate 14 having a main surface and a back surface, wherein said back surface has a central area, a distinct intermediate area surrounding said central area and a peripheral area surrounding said intermediate area; a semiconductor chip 10 formed on said main surface; two distinct groups of separate solder bumps 18: one in the signal, peripheral area and another in the heat transferring, central area, wherein an embodiment (example) drawn in Fig.2 clearly shows a first bump unit located in the distinct area beneath a thermally conductive slag 12 in said central area of said back surface, wherein said first bump unit radiates heat from said semiconductor device, said central bumps 18 disposed within a first distance between them, sufficiently close (touching

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each other), so that upon applying heat they are would be inherently capable to melt together. Bond et al teach furthermore a second, signal transmitting bump unit formed of solder bumps 18, Fig.2, located in the peripheral area of the back surface distinctly apart from the central unit of bumps 18 and at a second distance apart from each other, said second distance being greater than said first distance, wherein said second bump unit is greater in quantity of solder bumps that the first, central bump unit, said solder bumps are spherical in shape. Regarding to the statement the second distance is less than a width of the intermediate area (claims 20, 22, 24-29); and to the statement that the first distance being about 1 to 1.4 times the diameter of the bumps of the first bump unit, and the second distance being about 1.6 to 1.7 times the diameter of the bumps of the second bump unit (claim 31): Since, as it was shown above, applicant claimed device having substantially similar structure and functions as the device disclosed by Bond et al, it would have been obvious to one skilled in the art at the time invention was made to employ the second distance being less than a width of the intermediate area, and to make the first distance about 1 to 1.4 times the diameter of the bumps of the first bump unit, and the second distance about 1.6 to 1.7 times the diameter of the bumps of the second bump in the device by Bond et al in order to decrease possibilities of shortening of signal solder bumps, since such a modification would have involved a mere change in the sizes of the components or a mere change in the ranges of the distances between them. A change in size is generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 105 USPQ 237 (CCPA 1955). Establishing of such workable ranges would also have been obvious to one having ordinary skill in

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the art at the time the invention was made, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Applicant has not shown that these particular sizes or ranges of sizes are critical by showing that the claimed range achieves unexpected results relative to the prior art range. (*In re Woodruff*, 919 F. 2d 1575, 16 USPQ2d 1934, Fed. Cir. 1990). To establish unexpected results over a claimed range, applicant should compare a sufficient number of tests both inside and outside the claimed range to show the criticality of the claimed range. (*In re Hill*, 128 USPQ 197 CCPA 1960).

### ***Response to Arguments***

4. First: Regarding the statement that examiner has failed to establish a Prima Facie Case: First: Applicant claims a semiconductor device having a plurality of separate solder bumps grouped distinctly in the signal peripheral area and in the heat transferring central area. It is important to note that applicant does not claim a unitary heat transferring body made of the group of solder bumps in the heat transfer area as a part of the claimed structure. Instead the solder bumps in the heat transfer area are claimed as being placed close enough to be melted together upon application of a heat treatment. As it was written in the previous office actions, none of the other important for this technological process information, such as: sizes of the solder bumps, type of the solder, temperature and longevity of the heat treatment has not been claimed or

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explained in the specification. Second: Bond et al teach a semiconductor device 8, Figs 1-6, also having two distinct groups of separate solder bumps 18: one in the signal, peripheral area and another in the heat transferring, central area. In discussing figures of the Bond et al reference (page 10, lines 1-5) appellant omitted Fig.2, which clearly shows solder balls 18 located in the central, heat transfer area without any distance between them, which makes it obvious enough to conclude that upon applying heat they would definitely melt together. On the same Fig.2 signal solder bumps are shown located distinctly apart from the central group of bumps. Third: Based on the above examiner disagrees with applicants statement that: "The difference between the claimed invention and the reference by Bond et al is not a matter of degree, but rather one of kind". On the contrary, both devices are substantially similar semiconductor packages having the similar packaging, electronic and cooling design, wherein the difference is not even a matter of degree, but a fact that Bond et al do not claim certain relationships between distances between groups of solder balls and the solder balls themselves. However, by analyzing Fig.2, of the Bond et al reference, considering that a technology of solder balls (bumps) connections to avoid a shorting between them during a reflow (heat applying) process by manipulating sizes of the balls and/or the distances between them is well known in the art, it would be obvious to conclude that in the device by Bond et al an opposite result (melting them together) could also be achieved by manipulating sizes of the heat transmitting solder balls and/or the distances between them. From examiners point of view that is exactly what was done by Bond et al in order to prevent

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signal solder bumps from shortening between themselves and with heat transfer solder bumps.

5. Second: Regarding the statement that the applied references fail to suggest the claimed invention: First: There is only one reference – Bond et al, which was analyzed above as being substantially similar to the claimed device. Second: Applicant admitted in the previous communication that: "...in this case, a person of ordinary skill in the art could readily determine what spacing, or range of spacing, of the bumps in the first bump unit would be sufficiently close such that the bumps would fuse into a unitary body upon application of the heat treatment". Third: Contrary to the applicants arguments, the embodiment shown by Bond et al on Fig.2, no matter how different it is to all other teaching by Bond et al mentioned by the appellant, clearly suggests a structure very close to the one claimed in the instant application. Therefore, examiner concludes: First: Semiconductor device by Bond et al has enough similarities with the claimed semiconductor device to consider the reference by Bond et al suggesting all basic structural elements of the claimed invention combined in the similar way and having the same functions and qualities. Second: Thermal solder bumps shown on Fig.2 by Bond et al inherently would melt in a unitary body when applying a heat in a process of mounting the semiconductor package on a circuit board. Third: It would be obvious to one skilled in the art at the time invention was made to modify distances between groups of the signal and thermal solder bumps and between the signal solder bumps in the device by Bond et al in order to decrease possibilities of shortening of signal solder bumps.



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6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael V. Datskovskiy whose telephone number is (571) 272-2040. The examiner can normally be reached on 8-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynn Feild can be reached on (571) 272-2092. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Michael V Datskovskiy  
Primary Examiner  
Art Unit 2835

03/17/2005